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MEASUREMENTS OF RADIOACTIVITY IN WARSAW, POLAND, DURING THE YEAR 1959

POMIARY RADIOAKTYWNOŚCI W WARSZAWIE, POLSKA, W ROKU 1959

ИЗМЕРЕНИЯ РАДИОАКТИВНОСТИ В ВАРШАВЕ, ПОЛЬША, В 1959 ГОДУ

by

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Summary

The present report deals with regular surveys that have been carried out on air, fall-out, rain-, ground-, tap-, river-, and waste-water in the Institute of Nuclear Research. In addition, Strontium-90 in a number of samples of fall-out and milk has been determined. The results, 1027, are given in tables and plotted against time.

Streszczenie

Raport podaje wyniki systematycznych pomiarów radioaktywności powietrza, opadu, deszczu, wód gruntowych, wody wodociągowej, rzecznej i ścieków przeprowadzonych w Instytucie Badań Jądrowych. Oznaczono ponadto Stront-90 w pewnej liczbie próbek opadu i mleka. Wyniki (1027) przedstawiono w tablicach i na wykresach w funkcji czasu.

Изложение

Настоящая работа представляет результаты регулярных измерений радиоактивности воздуха, выпадений, дождя, грунтовой, водопроводной, речной и сточных вод в Институте ядерных исследований. Добавочно определялся стронтий-90 в некотором количестве образцов выпадений и молока. Результаты (1027) представлены в таблицах и диаграммах в функции времени.

INTRODUCTION

Measurements of the radioactivity of fall-out, rain water, aerosols, ground-, and river-water have been carried out by the Dosimetry Division of the Health Protection Department of the Institute of Nuclear Research (IBJ) in Warsaw since the summer of 1956. The results of measurements during the years 1957 and 1958 have been published (1,2).

This report presents 1027 original data from measurements during the year 1959. In that year the following observation were carried out systematically:

a) radioactivity of fall-out (every 24 hours),
b) radioactivity of rain water (every rainfall),
c) airborne radioactivity (every 24 hours),
d) ground-, tap-, river-, and waste-water (every month),
e) strontium-90 in fall-out (every month),
f) strontium-90 in milk (not regularly).

MEASUREMENTS OF TOTAL BETA RADIOACTIVITY

Sampling

All the samples of fall-out, rain water, and aerosols were collected in a sampling station, which is located between two one-storey builbings in the grounds of the Institute of Nuclear Research at Żerań (Warsaw). The distance between the buildings is approximately 100 m. The size of the station is 10 x 10 m.

Samples were collected as follows:

a) Fall-out was collected in special vinidur (plactic) pots with collection area of 0.1 m^2. The pots always contained some distilled water. In winter some methyl alcohol was added. The pots were installed on a bench about 1.5 m above the ground. The pots have been described before (1).

b) Rain water for the determination of radioactivity was collected in the same type of pot as for fall-out.

c) Airborne particles were collected on Whatman No.41 filter paper with a diameter of 12 cm. A rotary vacuum pump of efficiency

of about 60 m^3 per 24 hrs was used. To avoid vibrations of the filter a 5 litre reservoir was inserted between the pump and the filter itself. This volume was sufficient to hold the pressure constant under the filter. The pressure drop in the filter paper was approximately 5 mm of Hg. The sampling apparatus is placed in a special housing and the filter in a holder under a small roof is located 2.5 m above the ground.

d) Water for the determination of radioactivity was sampled at the following locations:

1. Vistula River, at IBJ-Żerań,
2. Świder River, at IBJ-Świerk,
3. Ground-water drains, IBJ-Świerk,
4. Basin of the Reactor "EWA" cooling water (the secondary circuit),
5. Local water supply, IBJ-Żerań,
6. Sewerage, IBJ-Żerań.

Preparation

The samples of fall-out, rain water (or snow), ground-, tap-, waste-, reactor cooling-, and river-water were prepared by the evaporation method. One litre of the water was evaporated on porcelain dish up to the consistency of a pap. The pap was wiped out very carefully with the filter paper for quantitative analysis. The filter paper with the pap was ashed in a porcelain crucible at a temperature of approximately 600°C for 5 hrs. The filter paper with the collected airborne particles was ashed under the same conditions.

Counting

All the ash samples weighing up to 200 mg were mounted on plexiglas discs of area 3 cm^2. The samples were counted by means of a G-M end-window tube type BAT-25 with a thin window of about 4 mg/cm^2 and an electronic scaler type EP-56. The lead castle walls were of 1 cm of Fe and 6 cm of Pb which reduced the background to about 8 cpm.

The quantity of ash for counting (200 mg) has been chosen on the basis of experiments demonstrating that for samples of up to 200 mg selfabsorption was negligible.

All the samples were counted at 72 hrs after collection, when the natural (short-lived) activity has almost completely decayed.

The results of the measurements are given with a statistical error having a probability of 95 per cent.

Calibration

Merck analytical grade potassium carbonate was used for calibration of the apparatus. According to P.M.Endt and C.M.Brams (3) the specific activity of natural potassium is

27.50 ∓ 0.25 beta particles / sec/g of K_{nat}.

which corresponds to:

743 pc/g of K_{nat}.

or 420 pc/g of K_2CO_3

The apparatus according to the natural potassium calibration had an average efficiency of about 16 %.

DETERMINATION OF STRONTIUM-90 IN FALL-OUT AND MILK

Fall-out

This analysis has been carried out on monthly samples regularly since January 1959. The fall-out for strontium-90 determination was collected in the identical pots as for the daily samples.

The samples analysis we have based on the method of J.Kooi (4) making some changes:

a) the samples were dried at a temperature of approximately 250°C for 2 hrs and then strontium carbonate precipitated (for removal ammonium compounds),

b) the yttrium from the strontium carbonate was precipitated after a period of about 20 days.

Milk

Strontium-90 analyses on dried milk have been carried out according to the method reported by E.A.Martell (5).

Calibration

A standard sample of strontium solution having an activity

91.1 ± 6.0 dpm

has been used for apparatus calibration. The sample has been received through the United Nations Scientific Committee on the Effects of Atomic Radiation from the U.S. A.E.C., Health and Safety Laboratory, N.York. The apparatus according to the Yttrium-90 (precipitated from the strontium-90 solution) calibration had an efficiency of approximately 17.6 %.

RESULTS AND DISCUSSION

The radioactivity of fall-out, rain water, and aerosols are shown in Tables I to XII and Figs. 1 and 2. Table XIII shows the average monthly radioactivity, and Fig.3 the diagram of the average monthly radioactivity in Warsaw for the years 1958 (2) and 1959 .

From our data it is seen that the atmospheric radioactivity has rapidly decreased during the second half-year 1959. The ratio of the average radioactivies of fall-out for the first half--year and for the second half-year 1959 is 6.64, and the ratio for aerosols is 10,60. This may be due to stopping the nuclear tests in the middle of 1959.

By the autoradiographic method "hot" particles were found in some samples of fall-out. This may explain the fact that we usually found different activities in samples collected simultaneously in the same place into identical pots.

The Tables XIV to XVIII presents the radioactivity of water (river-, ground-, reactor cooling-, tap-, and waste-water) sampled from the terrain of the Institute at Żerań (Warsaw), and at Świerk (near Warsaw). The mean activity of water is 16 + 22 pc/litre, but at the same time the mean content of potassium

in the Vistula River (6) is 4 ppm which corresponds to about 3 pc/litre. We suppose that the difference between these two values may be due to the activity of fission products.

The Table XIX contains data for Strontium-90 fall-out in Warsaw. The contribution of Strontium-90 to the total beta activity in the year 1959 was on average 1.26 %. P.Huber (7) reports the following data of the contribution of Strontium-90 in Switzerland:

1954	0.15 %	of Sr-90
1955	0.18 %	"
1956	0.60 %	"
1957	1.07 %	"
1958	0.95 %	"

The Table XX presents the Strontium-90 content in dried milk. The calcium content in milk ash is rather low and therefore the activity of Strontium-90 is relatively high (8,9,10). U.N.Scientific Committee on the Effects of Atomic Radiation (9) e.g. gives the following data for milk:

1955	1.9 ÷ 7.2	pc Sr-90/g of Ca
1956	1.2 ÷ 8.8	"
1957	2.7 ÷ 16.0	"

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N O T E

Symbols used in tables:

- \- lack of the sample or a result has no meaning;
- . trace amount of the radioactivity;
- *) peak-value; the result has not been taken into account in calculation of the average value.

References

(1) R.Szepke, Z.Gorberg, E.Klimaszewska, "Measurements of radioactive fall-out in Warsaw, Poland during the year 1957" Polish Academy of Sciences, Institute of Nuclear Research, Report No. 16/X doz. (1958)

(2) R.Szepke, Z.Gorberg, T.Deszczak, "Measurements of radioactive fall-out and aerosols in Warsaw, Poland during the year 1958", Polish Academy of Sciences, Institute of Nuclear Research, Report No. 68/X doz. (1959)

(3) P.M.Endt, C.M.Braams, "Energy Levels of Light Nuclei" Z = 11 to Z = 20 II. - Rev.Mod.Phys., 29, No.4 (1957), 683 - 756 .

(4) J.Kooi, "Quantitative Determination of Strontium-89 and Strontium-90 in Water" - Anal.Chem., 30, No.4 (1958), 532 - 535.

(5) E.A.Martell, "The Chicago Sunshine Method - Absolute assay of Strontium-90 in biological materials, soils, water and air filter" - The Enrico Fermi Institute for Nuclear Studies,The University of Chicago, May 1956

(6) W.Hermanowicz, Personal communication, 1959

(7) P.Huber, "2 Bericht der eidgenössischen Kommission zur Überwachung der Radioaktivität zuhanden des Bundesrates" Sonderdruck aus der Beilage B.No. 5/1958 zum" "Bulletin des Eidg.Gesundheitsamte

(8) A.W.Lebjedinskij, "Soviet Scientists about the Damage of Atomic Weapon Test", Moscov 1959 (in Russian)

(9) United Nations Scientific Committee on the Effects of Atomic Radiation, "Official records of the thirteenth session", Suppl. No. 17 A/3838/ - N.York (1958)

(10) Agricultural Research Council Radiobiological Laboratory, "Strontium-90 in Human Diet in United Kingdom, 1958" No.1, Her Majesty's Stationery Office, London 1959

Radioactivity during January 1959

Table I

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Jan.	0.83 ∓ 0.04	-	-	3.48 ∓ 0.12
2. "	0.46 ∓ 0.06	-	-	3.70 ∓ 0.19
3- 4. "	1.07 ∓ 0.06	-	-	2.68 ∓ 0.09
5- 6. "	4.71 ∓ 0.12	1.5	3440 ∓ 82	2.10 ∓ 0.08
7. "	5.53 ∓ 0.14	5.8	896 ∓ 23	1.22 ∓ 0.11
8. "	1.09 ∓ 0.06	-	-	0.73 ∓ 0.09
9. "	5.49 ∓ 0.10	9.2	884 ∓ 21	1.09 ∓ 0.13
10-11. "	3.08 ∓ 0.08	7.5	738 ∓ 21	1.55 ∓ 0.07
12. "	1.07 ∓ 0.06	-	-	3.38 ∓ 0.13
13. "	0.70 ∓ 0.06	0.5	-	2.66 ∓ 0.12
14. "	1.88 ∓ 0.06	0.3	-	1.92 ∓ 0.11
15. "	0.45 ∓ 0.06	.	-	2.58 ∓ 0.13
16. "	0.52 ∓ 0.06	-	-	1.10 ∓ 0.11
17-18. "	2.01 ∓ 0.08	-	-	1.95 ∓ 0.12
19. "	2.13 ∓ 0.10	-	-	4.26 ∓ 0.16
20. "		-	-	4.00 ∓ 0.18
21. "	0.41 ∓ 0.04	-	-	5.12 ∓ 0.19
22. "	0.51 ∓ 0.06	-	-	5.55 ∓ 0.78
23. "	0.67 ∓ 0.02	-	-	2.89 ∓ 0.14
24-25. "	3.58 ∓ 0.10	0.1	4900 ∓ 170	3.17 ∓ 0.27
26. "	5.32 ∓ 0.10	-	-	2.46 ∓ 0.12
27. "	0.73 ∓ 0.06	.	-	1.38 ∓ 0.10
28. "	0.87 ∓ 0.06	-	-	2.36 ∓ 0.14
29. "	4.34 ∓ 0.10	-	-	8.95 ∓ 0.40
30. "	1.31 ∓ 0.08	-	-	1.35 ∓ 0.10
31. "	7.50 ∓ 0.10	1.2	7090 ∓ 110	4.80 ∓ 0.20
Total	56.26 ∓ 0.40	26.1	-	-
Average	1.81 ∓ 0.01	-	1306 ∓ 13	2.83 ∓ 0.04

Radioactivity during February 1959

Table II

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Feb.	7.50 ∓ 0.10	-	-	4.80 ∓ 0.20
2. "	0.76 ∓ 0.08	-	-	1.99 ∓ 0.14
3. "	1.08 ∓ 0.06	-	-	3.40 ∓ 0.12
4. "	0.40 ∓ 0.04	-	-	3.44 ∓ 0.17
5. "	1.19 ∓ 0.08	-	-	0.93 ∓ 0.16
6. "	0.88 ∓ 0.06	-	-	3.53 ∓ 0.16
7- 8. "	0.67 ∓ 0.04	-	-	3.50 ∓ 0.10
9. "	0.46 ∓ 0.04	-	-	2.31 ∓ 0.17
10. "	1.57 ∓ 0.08	-	-	2.58 ∓ 0.14
11. "	0.30 ∓ 0.10	-	-	3.59 ∓ 0.14
12. "	0.53 ∓ 0.08	-	-	6.12 ∓ 0.12
13. "	0.47 ∓ 0.08	-	-	4.76 ∓ 0.17
14-15. "	2.50 ∓ 0.08	-	-	4.90 ∓ 0.12
16. "	0.21 ∓ 0.04	-	-	1.78 ∓ 0.13
17. "	1.65 ∓ 0.06	0.4	-	2.22 ∓ 0.13
18. "	0.58 ∓ 0.04	-	-	3.70 ∓ 0.20
19. "	0.58 ∓ 0.08	-	-	3.94 ∓ 0.23
20. "	1.40 ∓ 0.06	-	-	4.75 ∓ 0.18
21-22. "		-	-	1.41 ∓ 0.07
23. "	2.23 ∓ 0.06	0.1	2720 ∓ 165	2.06 ∓ 0.13
24. "		-	-	4.31 ∓ 0.16
25. "	9.52 ∓ 0.02	6.0	1780 ∓ 23	2.34 ∓ 0.15
26. "	1.61 ∓ 0.06	-	-	3.88 ∓ 0.22
27. "	0.31 ∓ 0.06	-	-	2.93 ∓ 0.12
28. "	0.50 ∓ 0.02	-	-	1.63 ∓ 0.10
Total	36.90 ∓ 0.32	6.5	-	-
Average	1.32 ∓ 0.01	-	1795 ∓ 23	3.24 ∓ 0.03

Radioactivity during March 1959

Table III

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Mar.	0.50 ∓ 0.02	-	-	1.63 ∓ 0.10
2. "	0.39 ∓ 0.06	-	-	1.66 ∓ 0.11
3. "	0.20 ∓ 0.04	-	-	3.08 ∓ 0.17
4. "	4.91 ∓ 0.14	2.3	2460 ∓ 120	4.24 ∓ 0.14
5. "	2.09 ∓ 0.10	-	-	4.93 ∓ 0.16
6. "	0.66 ∓ 0.06	-	-	2.76 ∓ 0.19
7- 8. "	7.86 ∓ 0.22	5.0	1220 ∓ 29	3.79 ∓ 0.08
9. "	0.47 ∓ 0.02	-	-	2.05 ∓ 0.13
10. "	0.53 ∓ 0.04	-	-	
11. "	0.85 ∓ 0.08	-	-	
12. "	0.48 ∓ 0.08	-	-	3.55 ∓ 0.09
13. "	1.34 ∓ 0.08	0.1	-	
14-15. "	4.51 ∓ 0.14	1.3	4040 ∓ 140	
16. "	0.45 ∓ 0.06	-	-	5.30 ∓ 0.23
17. "	0.37 ∓ 0.08	-	-	5.80 ∓ 0.20
18. "	1.16 ∓ 0.08	-	-	7.75 ∓ 0.30
19.""	0.34 ∓ 0.04	-	-	10.84 ∓ 0.26
20. "	0.17 ∓ 0.04	-	-	10.90 ∓ 0.26
21-22. "	0.88 ∓ 0.08	-	-	9.48 ∓ 0.13
23. "	0.39 ∓ 0.06	-	-	8.48 ∓ 0.27
24. "	1.95 ∓ 0.08	0.1	-	3.81 ∓ 0.18
25. "	0.25 ∓ 0.04	-	-	7.50 ∓ 0.23
26. "	3.00 ∓ 0.12	1.4	-	4.23 ∓ 0.20
27. "	0.26 ∓ 0.06	-	-	2.86 ∓ 0.16
28-30. "	6.84 ∓ 0.16	12.6	687 ∓ 13	0.60 ∓ 0.23
31. "	0.13 ∓ 0.04	-	-	2.96 ∓ 0.21
Total	40.98 ∓ 0.46	22.8	-	-
Average	1.32 ∓ 0.02	-	1211 ∓ 12	4.51 ∓ 0.03

Radioactivity during April 1959

Table IV

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Apr.	0.23 ∓ 0.04	-	-	2.17 ∓ 0.08
2. "	0.14 ∓ 0.06	-	-	
3. "	0.38 ∓ 0.06	-	-	1.23 ∓ 0.13
4- 5. "	36.90 ∓ 0.42	10.0	2916 ∓ 38	2.84 ∓ 0.11
6. "	2.15 ∓ 0.08	0.3	-	2.34 ∓ 0.11
7. "	-	-	-	4.23 ∓ 0.14
8. "	1.35 ∓ 0.08	-	-	7.48 ∓ 0.23
9. "	3.79 ∓ 0.40	0.4	-	7.05 ∓ 0.23
10. "	6.91 ∓ 0.17	1.1	-	2.13 ∓ 0.16
11-12. "	1.41 ∓ 0.06	-	-	1.88 ∓ 0.08
13. "	0.57 ∓ 0.06	-	-	1.60 ∓ 0.09
14. "	0.60 ∓ 0.06	-	-	2.10 ∓ 0.13
15. "	0.55 ∓ 0.06	-	-	2.09 ∓ 0.13
16. "	0.44 ∓ 0.06	-	-	2.22 ∓ 0.16
17. "	0.95 ∓ 0.08	-	-	5.58 ∓ 0.20
18-19. "	7.88 ∓ 0.19	5.5	980 ∓ 29	2.32 ∓ 0.08
20. "	1.45 ∓ 0.15	6.5	532 ∓ 21	2.26 ∓ 0.16
21. "	0.89 ∓ 0.06	-	-	3.04 ∓ 0.18
22. "	1.18 ∓ 0.08	-	-	5.10 ∓ 0.18
23. "	20.00 ∓ 0.28	13.5	1279 ∓ 18	3.00 ∓ 0.19
24. "	3.86 ∓ 0.14	0.6	-	2.68 ∓ 0.14
25-26. "	2.47 ∓ 0.12	-	-	4.76 ∓ 0.15
27. "	2.06 ∓ 0.04	-	-	5.42 ∓ 0.22
28. "		-	-	4.94 ∓ 0.23
29. "	2.80 ∓ 0.05	1.3	-	5.05 ∓ 0.18
30. "	1.90 ∓ 0.07	-	-	5.58 ∓ 0.16
Total	100.86 ∓ 0.78	39.2	-	-
Average	3.48 ∓ 0.03	-	1558 ∓ 14	3.44 ∓ 0.03

Radioactivity during May 1959

Table V

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactiviti in pc/m^3
1.May	1,90 ∓ 0.07	-	-	5.58 ∓ 0.16
2- 3. "	2.10 ∓ 0.08	1.8	-	2.22 ∓ 0.11
4. "	0.52 ∓ 0.04	-	-	4.26 ∓ 0.18
5. "	0.34 ∓ 0.06	-	-	5.20 ∓ 0.20
6. "	0.34 ∓ 0.06	-	-	6.90 ∓ 0.16
7. "	1.48 ∓ 0.06	-	-	5.88 ∓ 0.15
8. "	0.36 ∓ 0.06	-	-	5.96 ∓ 0.15
9-10. "	0.63 ∓ 0.08	-	-	6.11 ∓ 0.14
11. "	2.05 ∓ 0.10	-	-	6.53 ∓ 0.22
12. "	0.30 ∓ 0.05	-	-	4.96 ∓ 0.22
13. "	7.07 ∓ 0.20	1.2	-	3.84 ∓ 0.20
14. "	0.63 ∓ 0.08	-	-	5.50 ∓ 0.20
15. "	0.81 + 0.06	-	-	4.20 + 0.20
16-17. "	1.20 ∓ 0.09	-	-	4.47 ∓ 0.13
18. "	0.59 ∓ 0.06	-	-	3.80 ∓ 0.16
19. "	8.97 ∓ 0.20	3.6	946 ∓ 21	4.07 ∓ 0.22
20. "	8.64 ∓ 0.15	16.0	1163 ∓ 18	4.25 ∓ 0.21
21. "	0.78 ∓ 0.08	-	-	4.41 ∓ 0.18
22. "	0.53 ∓ 0.06	-	-	3.47 ∓ 0.19
23-24. "	5.37 ∓ 0.16	1.7	-	
25. "	0.38 ∓ 0.06	-	-	2.30 ∓ 0.08
26. "	1.90 ∓ 0.09	0.2	-	2.28 ∓ 0.13
27-28. "	0.47 ∓ 0.06	-	-	2.36 ∓ 0.11
29. "	0.40 ∓ 0.04	-	-	5.22 ∓ 0.23
30-31. "	0.35 ∓ 0.05	-	-	4.92 ∓ 0.15
Total	48.11 ∓ 0.48	24.5	-	-
Average	1.55 ∓ 0.02	-	1123 ∓ 15	4.30 ∓ 0.03

Radioactivity during June 1959

Table VI

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.June	0.42 ∓ 0.06	-	-	3.86 ∓ 0.16
2. "	1.21 ∓ 0.08	1.1	-	3.24 ∓ 0.19
3. "	2.11 ∓ 0.10	2.5	1096 ∓ 10	1.28 ∓ 0.13
4. "	0.62 ∓ 0.06	.	-	1.67 ∓ 0.14
5. "	1.12 ∓ 0.06	-	-	3.33 ∓ 0.17
6- 7. "	1.38 ∓ 0.08	-	-	4.29 ∓ 0.12
8. "	0.53 ∓ 0.06	-	-	4.14 ∓ 0.18
9. "	29.30 ∓ 0.70	29.0	975 ∓ 18	4.68 ∓ 0.38
10. "	18.30 ∓ 0.40	23.0	681 ∓ 16	-
11. "	2.40 ∓ 0.10	1.2	-	-
12-14. "	22.50 ∓ 0.30	6.5	3180 ∓ 24	-
15. "	2.00 ∓ 0.10	0.2	-	-
16. "	1.63 ∓ 0.10	-	-	3.04 ∓ 0.14
17. "	1.27 ∓ 0.08	-	-	3.23 ∓ 0.17
18. "	0.83 ∓ 0.07	-	-	3.31 ∓ 0.18
19. "	0.53 ∓ 0.06	-	-	2.84 ∓ 0.15
20-21. "	0.88 ∓ 0.07	2.5	-	1.84 ∓ 0.10
22. "	0.61 ∓ 0.08	-	-	1.87 ∓ 0.15
23. "	1.15 ∓ 0.07	-	-	-
24. "	0.49 ∓ 0.08	-	-	1.81 ∓ 0.14
25. "	0.81 ∓ 0.06	-	-	3.40 ∓ 0.17
26. "	0.53 ∓ 0.06	-	-	4.24 ∓ 0.33
27-28. "	3.98 ∓ 0.12	2.5	-	0.49 ∓ 0.09
29. "	4.29 ∓ 0.24	22.0	154 ∓ 8	1.58 ∓ 0.10
30. "	1.78 ∓ 0.08	2.1	655 ∓ 37	1.11 ∓ 0.12
Total	100.67 ∓ 0.97	92.6	-	-
Average	3.36 ∓ 0.03	-	847 ∓ 8	2.69 ∓ 0.04

Radioactivity during July 1959

Table VII

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.July	4.34 ∓ 0.17	9.0	492 ∓ 18	0.85 ∓ 0.12
2. "	1.93 ∓ 0.10	5.3	436 ∓ 19	1.02 ∓ 0.11
3. "	0.68 ∓ 0.05	-	-	0.77 ∓ 0.11
4- 5. "	0.19 ∓ 0.04	-	-	0.86 ∓ 0.13
6. "	0.33 ∓ 0.05	-	-	2.91 ∓ 0.49
7. "	0.25 ∓ 0.04	-	-	2.39 ∓ 0.37
8. "	0.18 ∓ 0.05	-	-	1.21 ∓ 0.15
9. "	0.13 ∓ 0.02	-	-	1.21 ∓ 0.16
10. "	0.18 ∓ 0.08	-	-	-
11-12. "	0.33 ∓ 0.08	-	-	0.87 ∓ 0.08
13. "	5.12 ∓ 0.19	5.4	826 ∓ 33	1.10 ∓ 0.51
14. "	0.20 ∓ 0.05	-	-	0.75 ∓ 0.08
15. "	0.25 ∓ 0.04	-	-	1.09 ∓ 0.13
16. "	0.58 ∓ 0.05	-	-	0.88 ∓ 0.14
17. "	1.50 ∓ 0.08	-	-	1.17 ∓ 0.11
18-19. "	1.85 ∓ 0.08	2.5	1184 ∓ 40	1.09 ∓ 0.07
20. "	0.27 ∓ 0.04	-	-	-
21-22. "	1.54 ∓ 0.06	6.0	498 ∓ 16	0.91 ∓ 0.08
23. "	1.20 ∓ 0.06	5.0	336 ∓ 8	0.43 ∓ 0.08
24. "	0.59 ∓ 0.04	-	-	0.40 ∓ 0.08
25-26. "	0.80 ∓ 0.05	1.7	-	-
27. "	0.25 ∓ 0.03	-	-	0.31 ∓ 0.06
28. "	0.34 ∓ 0.04	1.8	-	0.23 ∓ 0.07
29. "	0.58 ∓ 0.06	-	-	0.34 ∓ 0.07
30. "	1.70 ∓ 0.08	9.0	191 ∓ 9	0.25 ∓ 0.07
31. "	0.69 ∓ 0.07	7.5	193 ∓ 8	0.44 ∓ 0.04
Total	26.00 ∓ 0.39	53.2	-	-
Average	0.84 ∓ 0.01	-	442 ∓ 6	0.93 ∓ 0.035

Radioactivity during August 1959

Table VIII

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1- 2.Aug.	3.33 ∓ 0.10	-	-	0.44 ∓ 0.04
3. "	1.09 ∓ 0.06	-	-	0.62 ∓ 0.09
4. "	1.75 ∓ 0.08	1.4	-	0.32 ∓ 0.08
5. "	0.11 ∓ 0.04	-	-	0.41 ∓ 0.07
6. "	0.15 ∓ 0.04	-	-	0.33 ∓ 0.06
7. "	0.17 ∓ 0.04	-	-	0.37 ∓ 0.07
8- 9. "	0.45 ∓ 0.05	-	-	0.50 ∓ 0.04
10. "	0.15 ∓ 0.04	-	-	0.48 ∓ 0.07
11. "	0.15 ∓ 0.04	-	-	0.50 ∓ 0.04
12. "	0.17 ∓ 0.04	-	-	0.57 ∓ 0.08
13. "	0.37 ∓ 0.05	.	-	0.64 ∓ 0.08
14-16. "	5.32 ∓ 0.13	22.5	344 ∓ 11	0.66 ∓ 0.04
17. "	0.15 ∓ 0.04	-	-	0.51 ∓ 0.11
18. "	0.20 ∓ 0.04	-	-	0.50 ∓ 0.09
19. "	0.19 ∓ 0.04	-	-	0.60 ∓ 0.08
20. "	0.14 ∓ 0.04	-	-	0.72 ∓ 0.08
21. "	0.16 ∓ 0.04	-	-	0.57 ∓ 0.12
22-23. "	0.24 ∓ 0.04	-	-	0.26 ∓ 0.05
24. "	0.50 ∓ 0.05	-	-	0.37 ∓ 0.07
25. "	0.26 ∓ 0.04	-	-	0.30 ∓ 0.06
26. "	0.74 ∓ 0.05	-	-	0.30 ∓ 0.07
27. "		-	-	0.33 ∓ 0.06
28. "	0.37 ∓ 0.06	4.5	64 ∓ 10	0.29 ∓ 0.08
29-30. "	0.25 ∓ 0.06	.	-	0.15 ∓ 0.04
31. "	0.28 ∓ 0.06	0.4	-	-
Total	16.69 ∓ 0.28	29.1	-	-
Average	0.54 ∓ 0.01	-	298 ∓ 9	0.47 ∓ 0.01

Radioactivity during September 1959

Table IX

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Sep.	0.70 ∓ 0.08	6.8	80 ∓ 12	0.28 ∓ 0.08
2. "	0.17 ∓ 0.05	0.3	-	0.34 ∓ 0.08
3. "	0.14 ∓ 0.06	-	-	0.20 ∓ 0.08
4. "	0.11 ∓ 0.05	-	-	0.25 ∓ 0.09
5- 6. "	0.17 ∓ 0.06	-	-	0.15 ∓ 0.08
7. "	0.14 ∓ 0.06	-	-	0.26 ∓ 0.09
8. "	<0.11	-	-	0.29 ∓ 0.10
9. "	0.10 ∓ 0.06	-	-	-
10. "	0.09 ∓ 0.05	-	-	0.21 ∓ 0.08
11. "	<0.06	-	-	-
12-13. "	0.26 ∓ 0.06	-	-	0.28 ∓ 0.08
14. "	0.12 ∓ 0.05	-	-	0.14 ∓ 0.08
15. "	0.15 ∓ 0.05	-	-	0.22 ∓ 0.10
16. "	0.26 ∓ 0.05	-	-	0.12 ∓ 0.08
17. "	0.12 ∓ 0.05	-	-	0.16 ∓ 0.08
18. "	0.13 ∓ 0.05	-	-	0.25 ∓ 0.08
19-20. "	0.17 ∓ 0.05	-	-	0.15 ∓ 0.04
21. "	<0.09	-	-	0.26 ∓ 0.09
22. "	0.23 ∓ 0.06	0.2	-	0.19 ∓ 0.08
23. "	0.12 ∓ 0.03	0.7	-	0.13 ∓ 0.09
24. "	0.36 ∓ 0.04	5.6	53 ∓ 8	0.13 ∓ 0.08
25. "	0.05 ∓ 0.04	-	-	0.14 ∓ 0.09
26-27. "	0.18 ∓ 0.05	-	-	0.15 ∓ 0.04
28. "	0.18 ∓ 0.06	-	-	0.18 ∓ 0.08
29. "	0.05 ∓ 0.05	-	-	0.21 ∓ 0.08
30. "	0.05 ∓ 0.04	-	-	0.25 ∓ 0.09
Total	4.16 ∓ 0.27	13.6	-	-
Average	0.14 ∓ 0.01	-	69 ∓ 8	0.20 ∓ 0.01

Radioactivity during October 1959

Table X

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Oct.	0.20 ∓ 0.06	0.3	-	0.22 ∓ 0.07
2. "	0.10 ∓ 0.05	-	-	0.16 ∓ 0.08
3- 4. "	0.15 ∓ 0.04	-	-	0.14 ∓ 0.04
5. "	0.07 ∓ 0.04	-	-	0.12 ∓ 0.07
6. "	0.08 ∓ 0.05	-	-	0.16 ∓ 0.07
7. "	<0.07	-	-	0.32 ∓ 0.07
8. "	0.06 ∓ 0.04	-	-	0.12 ∓ 0.06
9. "	0.07 ∓ 0.04	-	-	0.18 ∓ 0.11
10-11. "	0.22 ∓ 0.04	0.1	-	0.16 ∓ 0.03
12. "	0.17 ∓ 0.04	2.5	48 ∓ 16	0.10 ∓ 0.06
13. "	0.08 ∓ 0.04	-	-	0.09 ∓ 0.05
14. "	0.04 ∓ 0.04	-	-	0.27 ∓ 0.07
15. "	0.10 ∓ 0.04	-	-	0.22 ∓ 0.06
16. "	0.06 ∓ 0.04	-	-	0.29 ∓ 0.06
17-18. "	0.36 ∓ 0.05	-	-	0.21 ∓ 0.04
19. "	0.07 ∓ 0.04	-	-	0.21 ∓ 0.06
20. "	0.17 ∓ 0.04	0.8	-	0.26 ∓ 0.08
21. "	0.25 ∓ 0.04	2.5	84 ∓ 16	0.23 ∓ 0.07
22. "				0.09 ∓ 0.06
23. "	0.11 ∓ 0.04	-	-	-
24-25. "	0.08 ∓ 0.04	-	-	0.13 ∓ 0.04
26. "	0.62 ∓ 0.05	-	-	-
27. "	0.12 ∓ 0.05	-	-	0.36 ∓ 0.11
28. "	0.74 ∓ 0.06	-	-	0.29 ∓ 0.08
29. "	0.49 ∓ 0.05	-	-	0.20 ∓ 0.09
30. "	0.16 ∓ 0.05	1.4	-	0.11 ∓ 0.06
31. "	0.06 ∓ 0.02	.	-	0.04 ∓ 0.03
Total	4.66 ∓ 0.23	7.6	-	-
Average	0.15 ∓ 0.01	-	66 ∓ 11	0.18 ∓ 0.01

Radioactivity during November 1959

Table XI

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Nov.	0.06 ∓ 0.02	-	-	0.04 ∓ 0.03
2. "	0.08 ∓ 0.04	.	-	0.09 ∓ 0.08
3. "	<0.07	-	-	0.17 ∓ 0.08
4. "	0.12 ∓ 0.03	-	-	0.13 ∓ 0.06
5. "	<0.09	-	-	0.11 ∓ 0.08
6. "	0.07 ∓ 0.04	-	-	<0.12
7- 8. "	0.07 ∓ 0.03	1.3	-	<0.08
9. "	0.14 ∓ 0.04	1.1	-	<0.14
10. "	<0.05	-	-	0.13 ∓ 0.06
11. "	0.09 ∓ 0.04	-	-	0.14 ∓ 0.09
12. "	0.05 ∓ 0.03	-	-	0.12 ∓ 0.07
13. "	0.07 ∓ 0.03	-	-	0.08 ∓ 0.06
14-15. "	0.15 ∓ 0.04	-	-	0.11 ∓ 0.04
16. "	0.15 ∓ 0.04	4.6	22 ∓ 9	0.12 ∓ 0.08
17. "	<0.06	-	-	0.17 ∓ 0.07
18. "	0.43 ∓ 0.14	5.3	79 ∓ 25	<0.12
19. "	0.14 ∓ 0.04	2.2	-	<0.10
20. "	0.08 ∓ 0.04	-	-	<0.10
21-22. "	0.05 ∓ 0.03	-	-	0.06 ∓ 0.04
23. "	0.05 ∓ 0.04	-	-	-
24. "	0.09 ∓ 0.03	-	-	<0.16
25. "	0.08 ∓ 0.05	-	-	<0.11
26. "	0.06 ∓ 0.05	-	-	<0.07
27. "	0.10 ∓ 0.05	-	-	0.09 ∓ 0.07
28-29. "	0.09 ∓ 0.03	1.8	-	<0.06
30. "	<0.05	-	-	0.12 ∓ 0.06
Total	2.54 ∓ 0.21	16.3	-	-
Average	0.09 ∓ 0.01	-	53 ∓ 7	0.11 ∓ 0.02

Radioactivity during December 1959

Table XII

Date of sampling	Activity of fall-out in mc/km^2	Rain or snow fall in mm	Activity of rain water in pc/litre	Airborne radioactivity in pc/m^3
1.Dec.	<0.04	-	-	<0.13
2. "	0.47 ∓ 0.12	5.5	62 ∓ 17	0.08 ∓ 0.06
3. "	0.22 ∓ 0.04	18.2	28 ∓ 3	<0.12
4. "	0.45 ∓ 0.06	-	-	<0.13
5- 6. "	0.29 ∓ 0.04	3.2	78 ∓ 12	<0.04
7. "	0.16 ∓ 0.04	1.1	-	<0.11
8. "	0.45 ∓ 0.09	2.6	94 ∓ 16	<0.10
9. "	0.19 ∓ 0.04	1.2	-	<0.14
10. "	0.31 ∓ 0.04	2.2	-	0.08 ∓ 0.07
11. "	0.35 ∓ 0.11	8.6	54 ∓ 10	0.10 ∓ 0.08
12-13. "	<0.07	-	-	0.04 ∓ 0.03
14. "	0.16 ∓ 0.05	.	-	<0.06
15. "	<0.06	-	-	<0.08
16. "	0.04 ∓ 0.03	-	-	<0.04
17. "	<0.04	-	-	0.07 ∓ 0.06
18. "	0.08 ∓ 0.03	3.7	38 ∓ 10	0.13 ∓ 0.07
19-20. "	0.06 ∓ 0.03	-	-	<0.05
21. "	0.11 ∓ 0.04	.	-	<0.12
22. "	0.11 ∓ 0.06	2.0	-	<0.08
23. "	<0.06	.	-	<0.07
24-27. "	0.59 ∓ 0.05	12.0	35 ∓ 4	0.06 ∓ 0.02
28. "	<0.12	-	-	<0.11
29. "	0.07 ∓ 0.06	-	-	<0.16
30. "	0.20 ∓ 0.07	8.5	26 ∓ 4	<0.12
31. "	0.04 ∓ 0.02	-	-	0.06 ∓ 0.03
Total	4.74 ∓ 0.31	68.8	-	-
Average	0.15 ∓ 0.01	-	42 ∓ 3	0.09 ∓ 0.02

Radioactivity during the year 1959 (monthly)

Table XIII

Month	Radioactivity of fall-out mc/km^2		Rain or snow fall mm	Activity of rain water pc/litre		Airborne radioactivity pc/m^3
	total monthly	average per day	total	maximum	average	average monthly
January	56.26 ∓ 0.40	1.81 ∓ 0.01	26.1	7090 ∓ 110	1306 ∓ 13	2.83 ∓ 0.04
February	36.90 ∓ 0.32	1.32 ∓ 0.01	6.5	2720 ∓ 165	1795 ∓ 23	3.24 ∓ 0.03
March	40.98 ∓ 0.46	1.32 ∓ 0.02	22.8	4040 ∓ 141	1211 ∓ 12	4.51 ∓ 0.03
April	100.86 ∓ 0.78	3.48 ∓ 0.03	39.2	2916 ∓ 38	1558 ∓ 14	3.44 ∓ 0.03
May	48.11 ∓ 0.48	1.55 ∓ 0.02	24.5	1163 ∓ 16	1123 ∓ 15	4.30 ∓ 0.03
June	100.67 ∓ 0.97	3.36 ∓ 0.03	92.6	3180 ∓ 24	847 ∓ 8	2.69 ∓ 0.04
July	26.00 ∓ 0.39	0.84 ∓ 0.01	53.2	1184 ∓ 40	442 ∓ 6	0.93 ∓ 0.04
August	16.69 ∓ 0.28	0.54 ∓ 0.01	29.1	344 ∓ 11	298 ∓ 9	0.47 ∓ 0.01
September	4.16 ∓ 0.27	0.14 ∓ 0.01	13.6	80 ∓ 12	69 ∓ 8	0.20 ∓ 0.01
October	4.66 ∓ 0.23	0.15 ∓ 0.01	7.6	84 ∓ 16	66 ∓ 11	0.18 ∓ 0.01
November	2.54 ∓ 0.21	0.09 ∓ 0.01	16.3	79 ∓ 25	53 ∓ 7	0.11 ∓ 0.02
December	4.74 ∓ 0.31	0.15 ∓ 0.01	68.8	94 ∓ 16	42 ∓ 3	0.09 ∓ 0.02
Average: first half year	-	2.12 ∓ 0.01	-	-	1310 ∓ 6	3.50 ∓ 0.01
second half year	-	0.32 ∓ 0.005	-	-	162 ∓ 3	0.33 ∓ 0.01
Total	442.57 ∓ 1.66	-	400.3	-	-	-

Radioactivity of water of the Vistula River in Warsaw during the year 1959

Table XIV

Date of sampling	Above the outlet of sewer of the Institute pc/litre	Below the outlet of sewer of the Institute pc/litre
30.01	22 ∓ 14	25 ∓ 10
31.01	12 ∓ 4	45 ∓ 4
16.02	9 ∓ 6	12 ∓ 6
17.02	16 ∓ 6	<12
25.03	440 ∓ 10*)	11 ∓ 6
26.03	12 ∓ 6	11 ∓ 4
29.04	<3	40 ∓ 5
4.05	11 ∓ 4	18 ∓ 4
5.05	22 ∓ 4	18 ∓ 5
21.05	14 ∓ 10	18 ∓ 10
22.05	26 ∓ 8	69 ∓ 8
23.05	8 ∓ 5	48 ∓ 7
26.06	74 ∓ 5	15 ∓ 5
27.06	13 ∓ 5	17 ∓ 8
29.06	40 ∓ 6	31 ∓ 5
18.08	21 ∓ 5	21 ∓ 4
19.08	10 ∓ 4	17 ∓ 5
20.08	59 ∓ 7	24 ∓ 6
30.09	22 ∓ 9	<18
1.10	28 ∓ 10	13 ∓ 5
2.10	22 ∓ 10	7 ∓ 6
3.11	18 ∓ 6	-
4.11	11 ∓ 8	-
5.11	16 ∓ 6	-
1.12	5 ∓ 4	12 ∓ 8
2.12	<10	-
3.12	10 ∓ 6	13 ∓ 7
28.12	10 ∓ 5	<8
30.12	10 ∓ 8	13 ∓ 8
Average	19 ∓ 1	22 ∓ 2

Radioactivity of water on the territory of the Institute at Žeraň during the year 1959

Table XV

Date of sampling	Tap-water pc/litre	Fire-basin-water pc/litre
27.01	13 ∓ 4	39 ∓ 4
28.01	8 ∓ 4	900 ∓ 18*)
3.03	38 ∓ 6	74 ∓ 8
26.03	17 ∓ 4	46 ∓ 8
27.03	11 ∓ 4	38 ∓ 6
25.04	41 ∓ 10	23 ∓ 14
27.04	62 ∓ 16	46 ∓ 10
28.04	10 ∓ 4	< 24
29.05	14 ∓ 5	29 ∓ 6
30.05	10 ∓ 5	32 ∓ 5
1.06	16 ∓ 5	44 ∓ 5
19.06	33 ∓ 5	58 ∓ 7
20.06	14 ∓ 4	34 ∓ 8
22.06	< 14	-
21.08	15 ∓ 14	-
22.08	16 ∓ 8	-
24.08	24 ∓ 10	60 ∓ 13
25.09	12 ∓ 7	-
26.09	10 ∓ 5	21 ∓ 14
28.09	16 ∓ 11	-
28.10	19 ∓ 9	24 ∓ 10
29.10	8 ∓ 7	42 ∓ 16
30.10	26 ∓ 10	24 ∓ 10
27.11	37 ∓ 12	34 ∓ 10
28.11	14 ∓ 8	27 ∓ 9
30.11	7 ∓ 4	-
3.12	-	29 ∓ 10
Average:	19 ∓ 2	38 ∓ 2

Radioactivity of waste-water from the territory of the Institute at Żerań

Table XVI

Date of sampling	The sewer of the Dept.XIII, +) pc/litre	The main collector of the Institute, pc/litre
29.01	362 ∓ 34	26 ∓ 6
30.01	135 ∓ 18	96 ∓ 16
16.01	59 ∓ 18	23 ∓ 22
17.02	83 ∓ 16	59 ∓ 6
25.03	53 ∓ 18	600 ∓ 28
26.03	244 ∓ 13	68 ∓ 16
28.04	220 ∓ 20	34 ∓ 12
29.04	239 ∓ 26	46 ∓ 17
4.05	84 ∓ 6	90 ∓ 5
21.05	1135 ∓ 40	83 ∓ 20
22.05	996 ∓ 44	196 ∓ 23
23.05	78 ∓ 26	225 ∓ 22
26.06	2830 ∓ 52	93 ∓ 14
27.06	2115 ∓ 38	229 ∓ 16
18.08	3150 ∓ 46	179 ∓ 28
19.08	275 ∓ 25	77 ∓ 17
20.08	16430 ∓ 200 *)	97 ∓ 18
30.09	21660 ∓ 215 *)	54 ∓ 14
1.10	5195 ∓ 90	427 ∓ 34
2.10	662 ∓ 30	237 ∓ 17
3.11	145 ∓ 23	48 ∓ 24
4.11	47 ∓ 14	1205 ∓ 38
5.11	287 ∓ 24	95 ∓ 18
1.12	141 ∓ 16	53 ∓ 11
2.12	59 ∓ 16	197 ∓ 18
3.12	2130 ∓ 82	68 ∓ 25
28.12	-	51 ∓ 14
29.12	63 ∓ 34	328 ∓ 25
30.12	188 ∓ 20	75 ∓ 16
Average:	807 ∓ 7	174 ∓ 4

+) Dep.XIII - Isotope Production and Distribution Department

Radioactivity of ground-water at Świerk during the year 1959

Table XVII

Date of sampling	Ground water at the reactor "EWA" pc/litre	Deep ground water at the reactor "EWA" pc/litre	Ground water at the Dept.1 *) pc/litre	The main collector of the ground water pc/litre
20.01	14 ∓ 6	-	28 ∓ 6	16 ∓ 2
21.01	13 ∓ 6	-	<8	<6
19.02	9 ∓ 6	-	298 ∓ 12*)	7 ∓ 6
20.02	15 ∓ 4	-	<11	10 ∓ 6
19.03	10 ∓ 8	-	42 ∓ 8	24 ∓ 6
20.03	<17	-	53 ∓ 12	<20
21.03	24 ∓ 16	-	21 ∓ 14	< 6
20.04	66 ∓ 12	-	<20	16 ∓ 12
21.04	10 ∓ 6	11 ∓ 8	<18	23 ∓ 4
23.04	<9	10 ∓ 7	33 ∓ 10	89 ∓ 6
25.05	<13	13 ∓ 6	29 ∓ 10	10 ∓ 4
26.05	26 ∓ 8	<13	<10	17 ∓ 5
27.05	57 ∓ 8	12 ∓ 8	18 ∓ 10	36 ∓ 5
23.06	14 ∓ 7	56 ∓ 10	<19	28 ∓ 6
24.06	17 ∓ 8	33 ∓ 8	35 ∓ 11	36 ∓ 6
25.06	14 ∓ 10	43 ∓ 30	15 ∓ 10	26 ∓ 7
26.08	9 ∓ 7	9 ∓ 8	<16	11 ∓ 4
27.08	<15	14 ∓ 9	25 ∓ 11	11 ∓ 6
28.08	9 ∓ 8	-	14 ∓ 7	11 ∓ 5
21.09	9 ∓ 8	<13	<18	9 ∓ 6
22.09	<12	< 8	<16	5 ∓ 4
23.09	<15	<12	13 ∓ 6	9 ∓ 4
22.10	17 ∓ 6	< 9	62 ∓ 10	144 ∓ 15*)
23.10	289 ∓ 12*)	212 ∓ 10*)	18 ∓ 10	439 ∓ 4*)
24.10	25 ∓ 8	17 ∓ 6	11 ∓ 6	12 ∓ 4
23.11	22 ∓ 8	9 ∓ 6	13 ∓ 8	<9
24.11	81 ∓ 7	19 ∓ 4	10 ∓ 8	6 ∓ 4
25.11	17 ∓ 10	6 ∓ 4	<14	39 ∓ 6
11.12	17 ∓ 7	8 ∓ 3	16 ∓ 6	<5
12.12	18 ∓ 6	9 ∓ 6	< 8	7 ∓ 5
14.12	73 ∓ 7	13 ∓ 5	13 ∓ 8	6 ∓ 3
Average	22 ∓ 2	16 ∓ 2	21 ∓ 2	18 ∓ 1

*) Dep.1 - Nuclear Physics Department

Radioactivity of water at Świerk during the year 1959

Table XVIII

Date of sampling	Waste water from the Institute pc/litre	River water of Świder pc/litre	Reactor cooling water (basin), pc/litre
20.01	8 ∓ 4	12 ∓ 4	1005 ∓ 6
21.01	6 ∓ 4	27 ∓ 4	109 ∓ 6
19.02	5 ∓ 4	22 ∓ 8	10 ∓ 2
20.02	17 ∓ 4	21 ∓ 4	408 ∓ 6
19.03	<16	21 ∓ 6	195 ∓ 8
20.03	<18	16 ∓ 4	174 ∓ 8
21.03	20 ∓ 12	11 ∓ 4	144 ∓ 12
20.04	28 ∓ 16	24 ∓ 8	277 ∓ 10
21.04	43 ∓ 6	23 ∓ 6	259 ∓ 10
23.04	74 ∓ 8	35 ∓ 12	1406 ∓ 22
25.05	43 ∓ 8	21 ∓ 4	617 ∓ 15
26.05	30 ∓ 6	20 ∓ 5	560 ∓ 14
27.05	5975 ∓ 55 a)	12 ∓ 5	1078 ∓ 6
23.06	43 ∓ 6	79 ∓ 6	364 ∓ 12
24.06	34 ∓ 7	20 ∓ 5	832 ∓ 22
25.06	52 ∓ 8	12 ∓ 5	546 ∓ 16
26.08	25 ∓ 7	12 ∓ 4	-
27.08	6 ∓ 3	7 ∓ 5	-
28.08	16 ∓ 5	<8	60 ∓ 7
21.09	18 ∓ 6	<6	87 ∓ 8
22.09	86 ∓ 7	<4	86 ∓ 8
23.09	31 ∓ 10	<7	104 ∓ 6
22.10	350 ∓ 14	21 ∓ 4	869 ∓ 16
23.10	20 ∓ 6	9 ∓ 6	742 ∓ 16
24.10	17 ∓ 5	10 ∓ 5	725 ∓ 6
23.11	110 ∓ 10	<6	434 ∓ 18
24.11	14 ∓ 4	10 ∓ 5	368 ∓ 5
25.11	46 ∓ 8	<7	774 ∓ 16
11.12	15 ∓ 7	13 ∓ 4	828 ∓ 21
12.12	12 ∓ 5	5 ∓ 4	534 ∓ 14
14.12	29 ∓ 6	<6	244 ∓ 9
Average	41 ∓ 2	16 ∓ 1	478 ∓ 2

The content of Strontium-90 in fall-out in Warsaw, 1959

Table XIX

Month	The content of Strontium-90	
	mc/km^2	per cent of total beta activity
January	0.52 ∓ 0.03	0.92
February	0.91 ∓ 0.03	2.47
March	0.28 ∓ 0.08	0.68
April	0.47 ∓ 0.07	0.47
May	0.48 ∓ 0.08	1.00
June	0.98 ∓ 0.04	0.98
July	1.12 ∓ 0.11	4.31
August	0.33 ∓ 0.07	1.97
September	< 0.12	2.90
October	< 0.14	3.00
November	< 0.14	5.50
December	< 0.10	2.10
Total	5.59 ∓ 0.32	-
Average	0.47 ∓ 0.03	1.26

The content of Strontium-90 in dried milk

Table XX

Date of dried milk production	Calcium content in ash, %	Strontium-90 content in milk	
		pc Sr-90/litre	pc Sr-90/g of Ca
11.03.58	13.8	37.9 ∓ 7.3	31.2 ∓ 1.1
"	"	28.9 ∓ 5.7	23.9 ∓ 4.6
"	"	16.9 ∓ 7.3	13.7 ∓ 6.0
5.09.59	14.3	12.1 ∓ 4.8	9.6 ∓ 3.8
"	"	24.2 ∓ 9.6	19.1 ∓ 7.7
"	"	19.3 ∓ 8.8	15.3 ∓ 7.0
"	"	37.9 ∓ 11.3	30.0 ∓ 8.9
"	"	32.2 ∓ 10.5	25.5 ∓ 8.2
"	"	33.8 ∓ 7.3	26.7 ∓ 5.7
"	"	31.4 ∓ 9.6	24.6 ∓ 7.6
"	"	25.8 ∓ 5.6	20.4 ∓ 4.5
"	"	36.2 ∓ 10.5	28.7 ∓ 8.3
Average	14.2	27.3 ∓ 2.4	22.7 ∓ 1.9

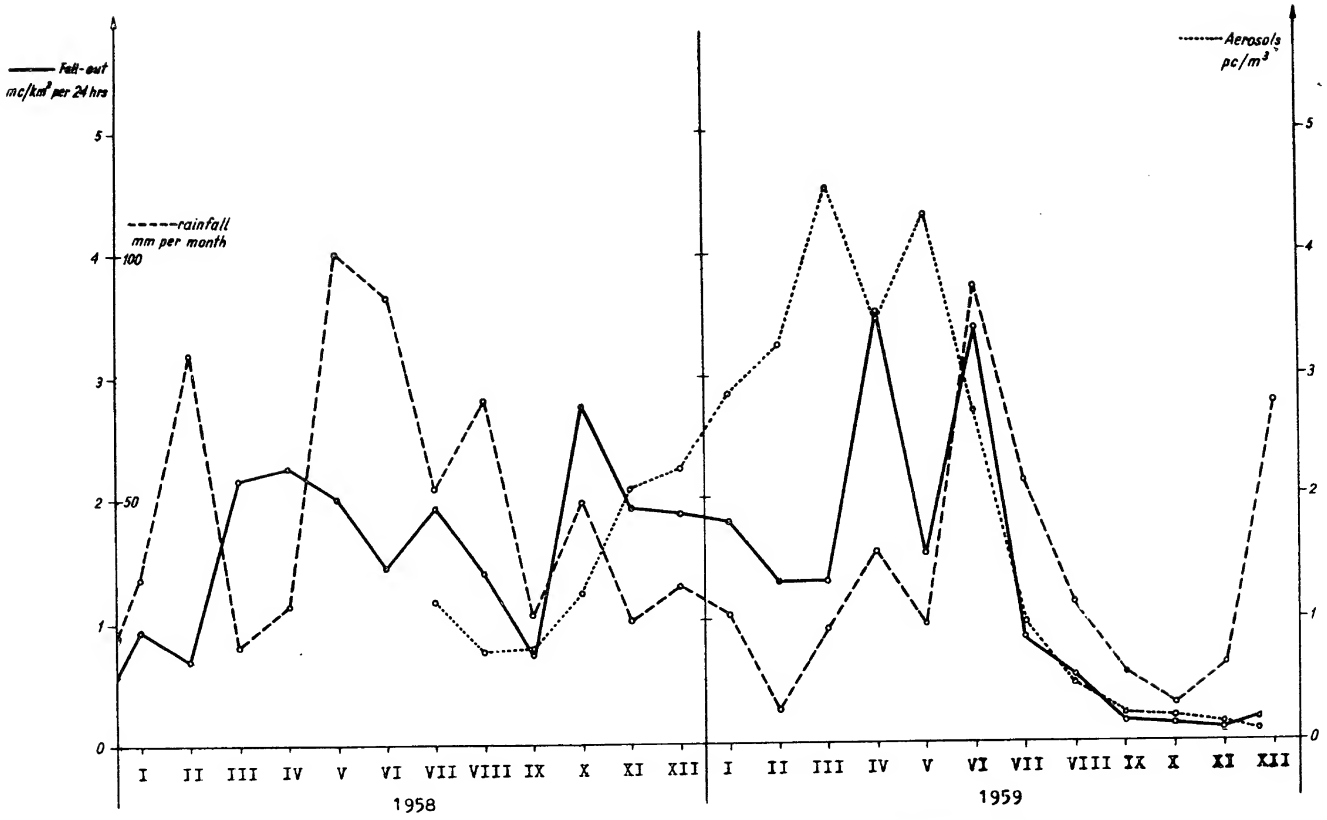

Fig.3. Monthly average radioactivity of fall-out and aerosols in Warsaw, Poland, during the years 1958 and 1959

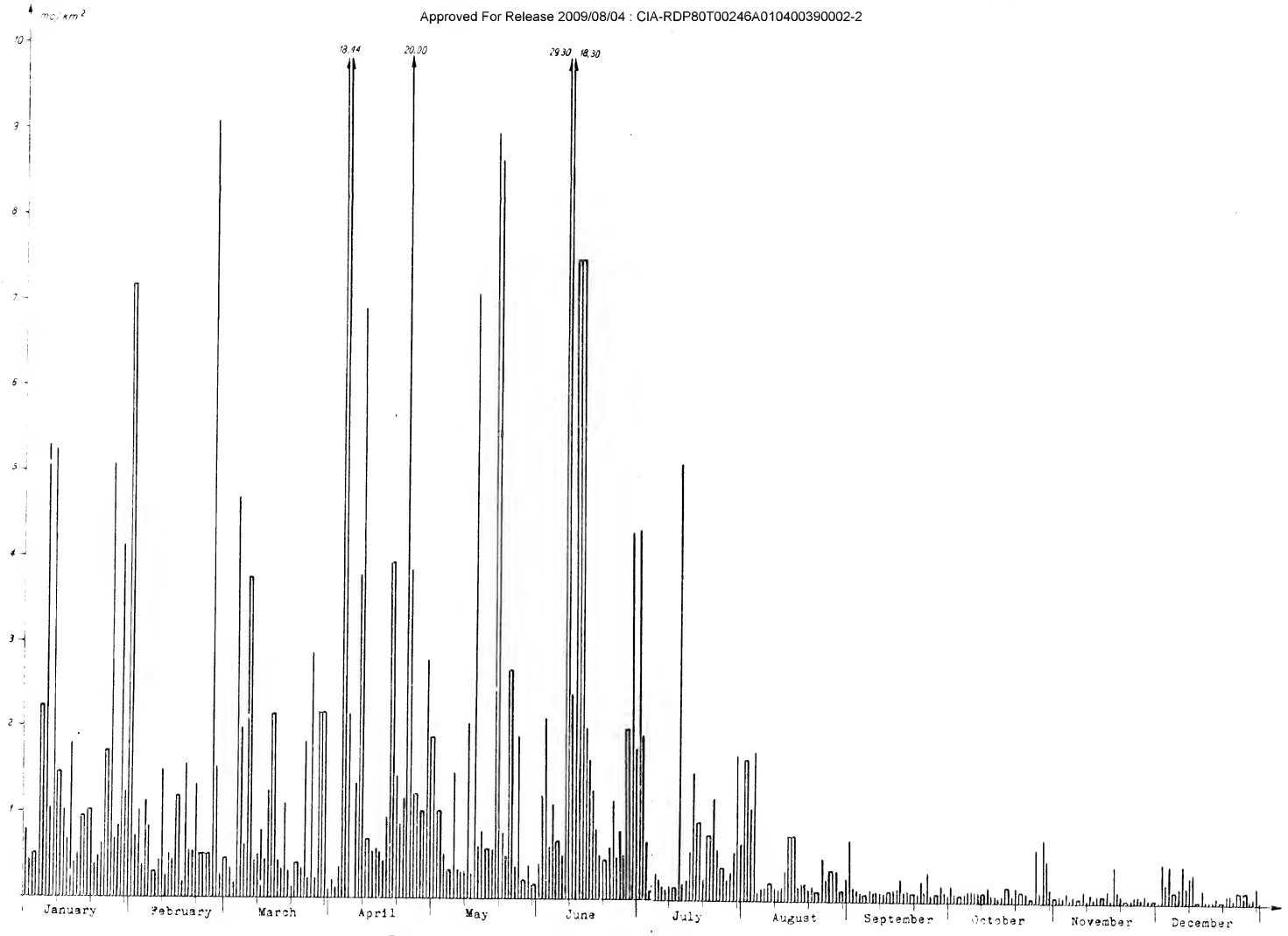

Fig. 1 RADIOACTIVE FALL-OUT DURING THE YEAR 1959

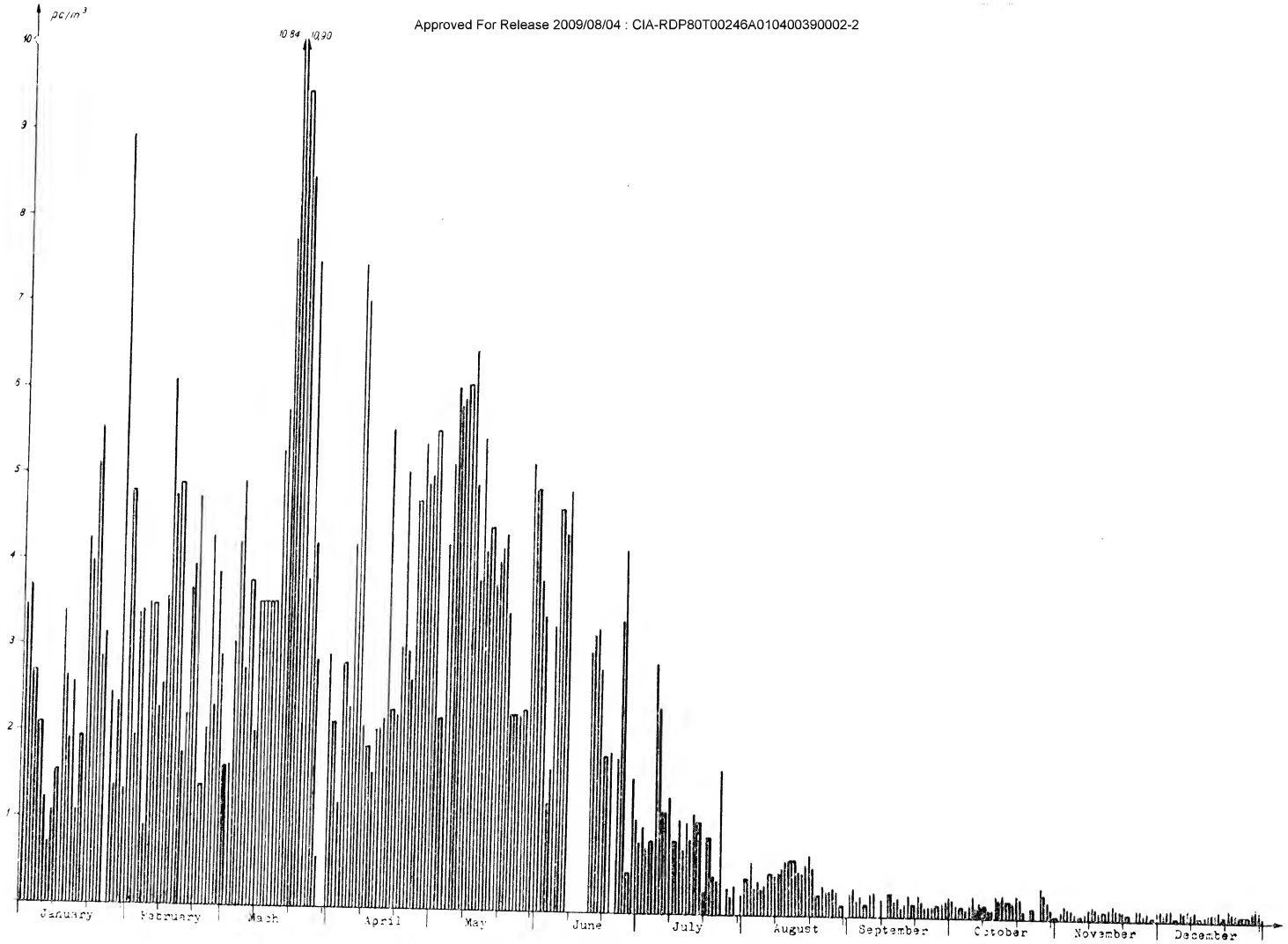

Fig. 2 ARTIFICIAL AIRBORNE RADIOACTIVITY DURING THE YEAR 1959